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The Manganese Ore Mineral Occurrences of Hungary*

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With 18 analyses, 2 crystal illustrations and 19 microphotos.

In addition to the two significant manganese-ore occurrences (Urkut and Eplény) which are also important from the economic point of view, there are still a few other occurrences known, which are however, only interesting from the point of view of mineralogy. All these occurrences have an origin of decomposition — sedimentation they can be further classified as follows:

local sedimentation, the mineral of the oxidized zone — *Rudabánya, Komlóska*

chemical sedimentation
- separated from sea water — *Urkut, Eplény, Lábatlan the surroundings of Eger*
- separated from sickering sweet water — *Mád*

Besides the places mentioned above manganese appears in traces still in numerous other places, these are, however, so insignificant that it did not deem of interest to deal with them.

RUDABÁNYA

The primary ore (1) of Rudabánya always contains as ismorphous mixture a few per cents of $MnCO_3$ the amount of which may even exceed 7 per cent. On decomposition, the manganese it contains separates partly from the iron and the independent oxidised manganese minerals appear in the oxidised zone. In the fissures of the ocherous limonite of Deákbánya permeated by barite veins the fine needled, according to (001) thinly tabulated crystals of pyrolusite are known. These crystals are about a mm. in size, speudomorph after manganite, resembling a slender boat and are terminated by faces curved in the third order prism zone. The globular, circular radiated aggregates of these crystals and the psilomelane of the Andrássy II. mine are also known. The psilomelane forming a globular reniform layer thicker than one cm. overlying the limonite exhibits an extremely fine lamellation-parallel to the surface. The well grindable, but only difficultly polishable, showing under the microscope a gray colour between crossed nicols anizotrope substance is the jumbled texture of fine threads, which is hardly visible under high magnification, in some places single larger threads, perpendicular to the lamellation, or

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radiated aggregates formed from them can be observed. The very tenacious mineral, its hardness approaching 6, is according to the analysis pure psilomelane the composition of which approaches the ideal one to a great extent.

	$H_4BaMnMn_8O_{20}$	Analysis 1.
MnO_2	72,77 %	65,68 %
MnO	7.42	9,74
Fe_2O_3	—	1.11
Al_2O_3	—	0.45
BaO	16.04	16.87
CaO	—	1.20
MgO	—	1.07
K_2O	—	tr.
Na_2O	—	tr.
H_2O+	3.77	3.74
SiO_2	—	0.67
	100,00 %	100.53 %

On our request *Mrs. Földvári* kindly examined this and still a few substances for hidden traceelements with the spectroscope in the laboratory of the Geological Institute. In the psilomelane from Rudabánya

Sr Rb

could be demonstrated with characteristic strong lines.

In the oxidised zone of the mine the presence of psilomelane could be anticipated considering that decomposition solutions contained manganese and barium.

KOMLÓSKA.

East of Sárospatak we find the Szkalka mountain belonging to the mountain range of Tokaj, lying in the vicinity of the small village of Komlóska, it is formed of pyroxene andesite. On its SSE side, in a height of about 315 m., the andesite fissure is filled out to an approximately length of 40 m. and to a breadth of at the utmost 8—10 m. with lamellated spring limestone passing over at its border into columnar crystallized calcite. Towards the border of the spring limestone always containing iron- and manganese-carbonate, thin jasper veins coloured yellow by iron hydroxide and black by manganese-oxide respectively, can be found. The iron hydroxide precipitated from the iron- and manganese- bicarbonate solutions sickering into the silicate gel penetrating into the fissures of limestone separated out in amorphous yellowish globules, whereas the mangan ore crystallized as either netlike veins composed of tiny crystal needles, or in aggregates consisting of extremely fine threads and globules (Fig. 1.) in the gel later crystallized to jasper. The very fine crystals forming pseudomorphs after manganite are according to the data of the second analysis pure pyrolusite:

Analysis 2.	
MnO_2	15.18%
Fe_2O_3	0,40
CaO	0,25
H_2O	0.57
SiO_2	83,89
	100,29 %

URKUT.

According to the investigations of *E. Vadász* the ore deposit is sedimented from sea water and originates from the upper Lias age. *F. Papp* (2) has investigated microscopically the minerals of these significant ore deposites observing psilomelane and polianite. According to him the groundmass consists of psilomelane, tarnished on the surface, into which the veins showing a metallic lustre and consisting of minute polianite crystals are embedded, as well as sometimes single polianite needles too. The ore occurs in thicker more compact banks, and in smaller and larger gnarls or grains embedded in clay. In the case of average samples taken at random according to *Vitalis I.* (3) the ore of the lower bank contains 27,16 per cent, the upper one 26,43 per cent and the selected pure ore 46,05—51,81 per cent manganese.

The ore of the banks is compact, extremely tenacious, its hardness approaching 6. The gnarls are of very varying denseness and stain strongly. The compact specimens having a conchoidal fracture, can be well ground and evenly polished. The gnarls are difficult to grind and almost impossible to polish. Under the microscope the tenacious, hard specimens proved to be a dense texture of felty very jumbled fine threads which are, as far as can be observed, anizotrope. In the piece made up of layers some larger pyrolusite needles, or flame — or iciclelike crystal aggregates of small pyrolusite needles, lighter in colour and harder than the groundmass, can be observed. The substance of the gnarlic ore which can already partly be established by the naked eye to be non — uniformous, proved under the microscope also to be a jumbled texture of extremely fine threads, however, this texture is not so compact, it can be scarified with a needle, cannot be polished, and takes up a great amount of moisture. This groundmass is intercalated by harder veins, far lighter in colour and easily polishable (Fig. 2). The material of the veins cannot be scarified with a needle they consist partly (the narrower ones) of a compact texture of fine pyrolusite thereads and partly of minute crystalline granular pyrolusite. The less hard groundmass mentioned above is attacked by fluoric acid exerting no influence on the compact veins permeating it.

The compact bank material is intercalated by substances richer in iron hydroxide and the manganese occurs as overgrowth in the form of very thin shining small crystals hardly attaining a mm. in size, along the fissures of the walls. The according to (001) flat tabular minute crystals showed by goniometric measuring the following forms:

(001) (010) (110) (410)

In the case of the slender boatlike minute crystals the slightly curved platelets of (001) are dominating. The very finely, perpendicularly striated plates of prisms (410) are well developed, form (110) and the b-pinacoid are represented by a shining little band (Fig. I).

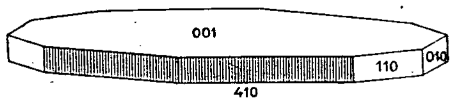

Fig. I.

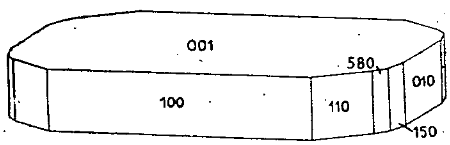

Fig. II.

Measured and calculated values

010 : 110	50°03	49°50
110 : 410	27°43	28°15

Sometimes the small crystals intergrow into fanlike groups running parallel to plate (001).

The surface of some of the gnarls exhibiting a concentric lamellated structure is covered in thinner or thicker layers by a limonite clay crust (analysis 6), the crust is sharply limited from the manganese-ore not containing any manganese at all. On a specimen which became available to us from a spot of the deposit — unfortunately is could not be ascertained from which — the fanlike aggregates of pyrolusite needles attaining already a length of a few cms. could even be well detected by the naked eye, (analysis 3). The specimen is intercalated by white crystalline calcite the border of which is full of extremely fine pyrolusite threads. We failed to prepare a polished section from the specimen, as its substance is very soft, cannot be polished and absorbs moisture to such an extent that it even absorbed the Canadian balsam diluted with xylol.

Three different analyses were prepared of the ores:

	Analysis 3, crystalline pyrolusite	Analysis 4. gnarlic ore	Analysis 5. compact bank ore
MnO_2	71,25%	65,81%	59,83%
MnO	6,56	5,72	9,30
Fe_2O_3	0,80	3,27	9,86
Al_2O_3	0,36	6,87	2,97
P_2O_5	0,54	tr.	0,41
CaO	6,06	0,45	1,36
MgO	0,17	0,19	0,44
BaO	1,32	0,54	0,59
K_2O	3,21	3,82	2,05
Na_2O	0,54	1,08	0,54
H_2O^-	0,59	0,71	1,91
H_2O^+	2,96	2,91	6,87
CO_2	4,76	—	—
SiO_2	0,23	8,63	3,66
	99,35%	100,00%	99,79%

Sr *Rb* can only be demonstrated spectroscopically.

The pure manganese content of the analysed ores is 50,11 per cent, 46,01 per cent, 45,00 per cent, respectively.

The data of the analyses were in good agreement with the results of the microscopic investigations the ores were mostly *pyrolusite*, whereas the psilomelane molecule contains an appreciable amount of barium (17,04 per cent) bound to the lattice, and the analyses only demonstrated a small quantity of barium. In addition to the predominating pyrolusite it must be assumed that a slight quantity of psilomelane furthermore, owing to the surprisingly large potassium content cryptomelane, perhaps even manganite is present which cannot be separately detected under the microscope.

A clayey-ironous soft crust substance of yellowish-brown colour encrusting some gnarlic ores was also analysed and the following results were obtained:

	Analysis 6.
Fe_2O_3	57.35%
Al_2O_3	6.97
CaO	0.32
MgO	0.56
H_2O^-	1.94
H_2O^+	11.40
SiO_2	21.51
	100.05%

Smaller concretions of marcasite occur embedded in the gray coloured clay. The small crystals encrusting the surface of the concretions are quite octahedronlike combinations of the form (011) and (101) developed in equilibrium. The apices are sometimes blunted by the smaller and larger planes of (001).

On the walls of the fissures of the clayey ore small water-clear crystal overgrowths of calcite stained by pyrolusite inclusions can be found. The crystals are combinations of the predominantly developed forms of $(01\bar{1}2)$ and $(10\bar{1}0)$. The water-clear calcite crystals, overgrown on the wall of the fissures of the Lias limestone are richer in planes and larger. By gonometric measurement the following forms were established:

$$(017\bar{17}1), \qquad (02\bar{2}1), \qquad (10\bar{1}1), \qquad (21\bar{3}1).$$

The gently curved planes of the negative steep rhombohedron dominate, furthermore the lustreous planes of $(02\bar{2}1)$. The unit rhombohedron appears in 1—2 lustreous bands. The planes of scalenohedron are minute but well-developed.

Thus the ore minerals of the manganese deposit of *Urkut* are the following:

Dominating mineral: pyrolusite.*

Accessory minerals: cryptomelane, psilomelane, manganite.

Nonore minerals: calcite, quartz.

Dominating elements of the ore deposit: *O Mn Fe Si Al K Ca H.*

Elements not exceeding 1 per cent: *Ba, Na, Mg, P, C, S.*

Only spectroscopically demonstrable elements: *Sr Rb.*

As can be seen this chemically created, sedimented, manganese-ore deposit contains all the eight dominating elements of the crust of the earth and of these only *Na* and *Mg* can be detected in an amount not exceeding 1 per cent. The presence of phosphorous in measurable quantities points to the fact that organisms also played a role in the formation of the ore.

EPLÉNY.

Concerning its origin and geological age this deposit is identical to that of Urkut, however, it is of less economic importance, from the point of view of the mineralogist on the other hand it is more interesting.

The minerals were also examined by *F. Papp,* according to him psilomelane, polianite, pyrolusite, manganite and braunite are present in the ore. *A. Földváry* (4) mentions as non-ore accessory minerals crystallized quartz and chalcedony. It is striking that in Epléný there is far more, and more beautiful crystalline-crystallized ore (manganite-pyrolusite) than in Urkut. The most beautiful crystallized ore can be

* According to *F. Papp* the ore is polianite, however, the contrast is our views is only apparent. The names polianite and pyrolusite involve the same mineral only according to the most recent literary conception the term polianite is only used if well developed tetragonal crystals are found; whereas the pseudomorphoses after manganite and he crystalline substance not at all corresponding to the ideal composition of MnO_2 are termed pyrolusite.

found in the specimens impregnated with silicate. In Eplény the lower part of the ore deposit contains a significant amount of quartz (jasper, chalcedony and rock crystal). The over- and ingrowths crystals of the more rapidly crystallising manganite, which later altered to pyrolusite, grew into originally gelatinous silicate gel, which owing to its viscosity crystallised less quickly. In the compact very finely threaded groundmass of the ore the crystalline granular pyrolusite veins are more frequent than in Urkut.

Manganite can be detected in very fine small crystals in crystalline ore overgrown, or as ingrowths in quartz. The small cryståll overgrowths are encrusted by a chalcedony layer. In pieces of ore not containing quartz the small manganite crystals are not so frequent, they could only be found overgrown on the walls of hollows of a few crystalline specimens. These crystals can be removed, those intergrown in quartz broke up entirely when their separation was attempted. The colour of the manganite crystals is darker their lustre weaker than that of the ore already altered into pyrolusite. On manganite crystals mm. in size which had already been separated goniometrically the following forms could be established:

(001) (100) (150) (580) (110)

Form (001) is predominating, the forms of (100) are well developed, those of (110) averagely, the plates of the two other prisms are thin bands. The crystals proceed along the crystallographical *b* axis. A dipyramidic plate also plays a role on the crystals, however, considering that these are curved and dim, the applied measurements did not offer any data which could have been used for their determination. (hkl:hkl about 22° — about 24°). (Fig. II).

The determination of the forms is carried out according to the following measured and calculated angle-values:

010:150	13°06'—13°34'	13°20'
150:580	23°22'—23°36'	23°10'
580:110	12°52'—12°59'	13°20'
110:100	40°21'—40°32'	40°10'

The dominantly developed plates are a little curved. The crystal overgrowths enclosed in quartz resemble partly the former ones and partly as can be seen from their crossection illustrated in Figs. 1. and 4. to those of Urkut described above. On them in addition to the (001) plate, the plates of forms (010), (110) and the predominantly developed (410) play a role, on some crystals even only the plates of the latter form can be detected. The crystals proceed along the crystallographic *c* axis they are columnar. The crystal ingrowths in the quartz are as in demonstrated in Fig. 5. according to plate (100) tabulated, and the plates of form (110) on them unequally, or not completely developed resulting in some of the crystals seeming to be monoclinic. A part of the manganite crystals still growing freely in the gelatinous silicate gel was disrupted by the subsequent dehydration of the gel and its crystallisation into chalcedony, as can be seen on the crystal shown in Fig. 4. The chalcedony crystallized later, even sometimes replaces the crystals of the older manganite (Fig. 6.).

The manganite crystals can easily be ground and well polished. Under the microscope they are well reflected exhibiting a brownish-gray colour with a well detectable pleochroism (light gray — dark-gray). Between crossed nicols the interference is strikingly strong (the sections are almost perpendicular to axis c):

Dark violet — light — slightly brownish violet.

In oil immersion the reddish — brownish internal reflexes can be observed on certain points of the polished surfaces. The polished surfaces of the crystals were not attacked by any chemical. On some of the manganite crystals it is well visible that its substance, particularly on the borders, has already partly oxidised into pyrolusite (Fig. 7). We failed to prepare pure manganite for the analyses, however, the high content of MnO of analyses 7 and 8 indicates that the ore contains besides pyrolusite also much manganite.

	Analysis 7.	Analysis 8.
MnO_2	55,17 %	75.37 %
MnO	28.00	11.77
Fe_2O_3	0.23	1.94
Al_2O_3	—	0.68
P_2O_5	—	0.54
CaO	0.53	0.45
MgO	—	0.10
BaO	—	0.18
K_2O	—	2.99
Na_2O	—	0.61
H_2O^-	—	0.24
H_2O^+	6.27	4.22
SiO_2	9.65	0.86
	99.85 %	99.95 %

The pure manganese content of the ore specimens were 56,54 per cent and 56,75 per cent, respectively.

The two analyses of the ores were made so that the material of analysis 7 was taken from the crystalline part in the immediate vicinity of the chalcedony layer, whereas that of analysis 8 was collected from the other side of the specimen where the crystalline granular ore already proceeds into an extremely finely threaded compact, felty mass. At the formation of this mass in addition to manganite and pyrolusite cryptomelane also participates.

As ingrowths in quartz (in chalcedony) sheaflike groups (Fig. 8) consisting of beautiful manganite crystals looking like pointed needles can frequently be observed, as well as very fine needles splitting at their end into still finer threads. The initial thicker thread is still definitely steel gray coloured with a metallic lustre however, the thinner threads resulting from its fraying are brownish red, having rather a diamond lustre. Such threads are shown in Fig. 9.

Very frequently we found, enclosed in crystalline quartz dark gray patches looking like plumosite, consisting of aggregates of jumbled incredulously fine threads, from the border of the patches very fine threads proceed into the quartz. These always quite opaque threads exhibit in reflected light the brownish-red colour mentioned above. Owing to their infinitely small quantity it was not possible to collect enough of them to carry out a quantitative analysis. However, the qualitative analysis only demonstrated manganese in the examined material which is in our opinion manganite. Considering that this extremely finely threaded material is enclosed in all directions by quartz it could not oxidise into pyrolusite (Fig. 10).

In the ore of Eplény the crystals creating very fine pseudomorphs after manganite and their aggregates and crystalline masses having already in the greater part been oxidised to pyrolusite can be found in more significant amounts than in the ore of Urkut. The crystal overgrowths on the walls of the smaller hollows of the crystalline ore permeating in veins the compact ore are columns elongated to axis *c* on which the plates of (001) and the strongly curved plates of (hk0) prisms are to be found. Owing to their being strongly curved the plates of the prisms zone cannot be measured. Really speaking each single larger crystal is an aggregate of a parallel intergrown smaller crystal aggregate. The crystalline specimens are not easy to grind and polish, they break out-being as it is fissured—owing to their shrinkage in the direction of the *b* crystallographic axis. A well reflecting surface can only either difficultly, or not at all, be obtained. In spite of this, under the microscope, particularly in oil the strikingly yellow tint of the ore can be easily detected and between crossed nicols the strong interference:

with slightly pinkish-white-pink-brownish colours.

These coarser or finer crystalline-granular crystalline pyrolusite aggregates, pseudomorph after manganite, crumble very easily, reduce to dust and stain strongly.

As to their chemical composition it proved to be almost pure pyrolusite as is shown in the following three analyses of which 9 and 10 are made of coarse granular crystalline substance and 11 of fine one.

	Analysis 9.	Analysis 10.	Analysis 11.
MnO_2	96.05 %	94.69 %	84.78 %
MnO	2.18	3.83	4.19
Fe_2O_3	tr.	tr.	1.04
H_2O	1.35	1.43	0.75
SiO_2	0.72	0.37	9.59
	100.30 %	100.32 %	100.35 %

The pure manganese content of the ores is 62,90 per cent, 62,88 per cent and 57,25 per cent, respectively.

The specimen in which pyrolusite pseudomorphs after manganite are ingrown in the finely threaded compact groundmass (Fig. 11) is striking. On these pseudomorphs the cleavage parallel to plane (010) are well visible. On the pyrolusite showing a stronger lustre than the groundmass, and in contrast to the latter a characteristic yellowish tint, the interference colours characterising the mineral can be well detected between crossed nicols.

As inclusion in jasper pyrolusite can be found very often in iciclelike groups consisting of very fine threads (Fig. 12). The crystalline irregularly arranged groups contained in jasper attain sometimes a size of one cubic centimeter.

Furthermore, a compact, very finely threaded specimen of pyrolusite into which finely threaded loose ore is deposited, surrounded by the compact groundmass in a cellike manner, is also an interesting phenomenon (Fig. 13). The material bordering the „cells" is compact, hard and easily polished, as contrasted with the soft unpolishable loosely threaded soft material, also diverging in colour from that of the groundmass, which fills out the cells, and can be poked out in the form of a black powder with a pin.

The compact ore from Eplény termed psilomelane exhibits the crystal aggregates consisting of parallel intergrown pyrolusite threads lighter in colour and harder than the colour of the groundmass. The material of the ore is also predominantly pyrolusite, it is, however, at least in the specimens analysed by us, to a greater extent contaminated with iron, quartz and clay than that of Urkut.

	Analysis 12.	Analysis 13.	Analysis 14.
MnO_2	54.23%	46.47%	43.28%
MnO	8.22	3.63	2.60
Fe_2O_3	7.84	21.24	7.37
Al_2O_3	5.78	3.67	8.41
P_2O_5	0.09	0.36	0.88
CaO	1,59	1,83	3,27
MgO	0.83	0.37	0.62
BaO	2.45	2.15	1.60
K_2O	2.25	2.11	5.23
Na_2O	1.49	3.12	1.69
H_2O-	2.35	1.21	4.66
H_2O+	4.08	6.31	5.18
SiO_2	8.59	7.92	15 69
	99.79%	100.39%	100.48%

Sr, Rb can only be detected spectroscopically.

The pure manganese content of the examined ore specimens is 40,63 per cent, 32,17 per cent and 29,36 per cent.

The material of analysis 12. is a so-called „groaty ore", that of 13. is compact and contaminated with iron which can even be seen by the naked eye, and finally that of 14. is also compact and clayey. The two latter derive from the West cut of the third level.

From the data of the examinations and analyses it can be established that the bulk of the material of these ores is pyrolusite, containing smaller amounts of psilomelane, cryptomelane and relict manganite. The strikingly high K_2O content of the ore belongs partly to the clay minerals. Interesting is the presence of rubidium — that so very dispersed trace element — in every spectroscopically examined ore specimen.

The ore is associated as mentioned above with quartz variations. Among these the following specimens can be found: jasper coloured yellow by ferric hydroxide, the bluish coloured chalcedony and the water clear, whitish quartz, sometimes stained by the manganite needles it contains as inclusione to a grayish — black.

In thin sections the chalcedony contained as inclusions in the pyrolusite forms frequently beautiful spherulites (Fig. 14. and 15). These spherulites sometimes proceed outwards into crystallised quartz, bounded by terminal planes. On particular interest are those specimens on which the further growth of the spherulites also proceeds into crystallised quartz and the rythmic growth can be splendidly seen on the quartz crystals along the boundary of the terminal planes (Fig. 16).

On some polished sections the extremely finely fibrated chalcedony replacing the limiting manganite crystals is very well visible, the interspaces of the chalcedony bands are filled out by fine crystalline jasper (Fig. 17). In most of the thin sections chalcedony, jasper and crystallised quartz can be seen together enclosing the ore or partly replacing it. (Fig. 18).

The material of the chalcedony is generally pure, free from all inclusions, the gel has eliminated in the course of its crystallization all foreing impurities. Jasper is full, mainly along the boundaries of the granules, with iron hydroxidic impurities. The crystallised quartz may contain — as has already been observed by *Földváry*[4] — fine manganite needles as inclusions causing the grayish-black colour of the quartz crystals. On the walls of the small hollows of chalcedony and on those of the crystalline ore, sometimes, as overgrowth on pyrolusite crystals, more or less encrusting them can be detected the stout columnar minute crystals of the quartz representing a combination of the three forms mentioned by *Földváry*

$$(10\bar{1}0) \qquad (10\bar{1}1) \qquad (01\bar{1}1).$$

In the fissures of the limestone of the Lias age, as well as on the walls of the hollows occurring in pyrolusite, calcite is often present in crystal overgrowths. The crystal overgrowths on limestone are 2—8 mm. long, water clear, the $(21\bar{3}1)$) scalenohedron planes are developed predominantly on them, their apeces are blunted of by the minute faces of the unit rhombohedron. The 1—2 mm. sized single crystals having slightly curved faces forming white globular groups which can be found in the hollows of pyrolusite are formed by scalenohedron $(21\bar{3}1)$) and by the form not of the calcites contains manganese even in traces.

Thus the ore minerals of the manganese ore deposit of Eplény are:

Dominating	pyrolusite,
accessory	manganite, cryptomelane, psilomelane, limonite.
non-ore minerals	quartz, (chalcedony, jasper, rock crystal) calcite.

The braunite mentioned by F. Papp could not be found.

The ore deposites of Úrkut and Eplény like all differentiated ore occurrences are poor in minerals as well as in elements.

The dominating elements of the ore deposit: *O Mn Fe Si Al K Ca H.*

Those occurring in amounts not exceeding 1 per cent: *Ba Na Mg P C.*

Those which could only be detected with the spectroscope: *Sr Rb.*

LÁBATLAN.

In the neighbourhood of Lábatlan in the stone quarry of Tölgyhát *E. Vadász* found deposited in limestone of the age of the middle Lias traces of manganese ore. The age and origin of the ore is identical to that of Urkut and Eplény.

In the compact black coloured ore with extremely small granules some more coarsely crystalline parts can already be detected by the naked eye, as well as lamellated calcite deposites. In thin sections the lamellated calcite crystals replacing the ore, and in the interior of the ore, some small barite crystals exceeding one mm. in size, replaced by the ore are well visible. The ore can be well ground and polished the above mentioned more coarsely crystalline part is harder than the finely granulated one forming the fundament. Under the microscope the groundmass is extremely finely granulated, anisotrope, containing iciclelike pyrolusite crystal aggregates. The more coarsely crystalline crystals can be well detected. The pleochroism is clearly visible, the crystallographic c axis the slender boat shape of the manganite crystals can be well detected. The pleochroism is clearly visible, the interference is very bright and characteristic. *HF* renders the ground material slightly obscure turning its colour into brown, but on manganite it causes hardly any visible dimness. The groundmass of the inclusion consisting purely of manganite crystals is according to the analysis a mixture of manganite — pyrolusite — psilomelane containing a small quantity of calcite and barite (Fig. 19).

	Analysis 15.
MnO_2	52.30%
MnO	23.09
Fe_2O_3	0.34
Al_2O_3	1.57
P_2O_5	tr.
BaO	11.09
CaO	1.72
MgO	tr.
K_2O	0.06
Na_2O	0.68
CO_2	1.35
SO_3	1.07
H_2O-	0.44
H_2O+	6.04
SiO_2	0.83
	100,58%

The analysed ore contains 3,14 per cent barite the amount of barium exceeding this percentage belongs to the psilomelane molecule taking part in the formation the groundmass.

It is very interesting that chalcopyrite could be detected in the ore in the form of very minute crystal ingrowths not exceeding 0,1 mm. in size and also as crystalline granules. In the analysed specimen copper could not even be detected in traces. The chalcopyrite arising from the minimal copper contained in the sediment is syngenetic to the manganite.

THE VICINITY OF EGER.

In the neighbourhood of Eger, deposited in clay originating from the middle Oligocen age manganese ore occurs in slight traces. The specimens examined by us derive from occurrences in the vicinity of Almagyar and Bátor, their material cannot be mineralogically determined it is a black gel contaminated with clay and iron hydroxide. The results of the analyses are:

	Analysis 16. Almagyar	Analysis 17. Bátor
MnO_2	54.71%	8.56%
MnO	1.05	9.21
Fe_2O_3	3.62	18.67
Al_2O_3	3.50	12.83
P_2O_5	0.38	0.12
CaO	5.84	2.21
MgO	2.09	0.75
BaO	0.15	0.14
K_2O	1.28	1.69
Na_2O	1.28	1.85
H_2O+	10.49	7.35
H_2O-	6.54	3.41
SiO_2	9.54	33.08
	100.47%	99.87%

The pure manganese content of the very weak „ores" is 35,38, and 22,53 per cent, respectively.

The one originating from Almagyar, disregarding the impurities, is almost pure pyrolusite, that from Bátor contains manganite too.

MÁD:

Besides the already exposed iron ore of Dióshegy, mainly on the borders of the earlier ore deposit pyrolusite also occurs in patches in opalic quartzous material. The analytical data of a specimen found there is:

	Analysis 18.
MnO_2	37.72%
Fe_2O_3	3.06
Al_2O_3	2.85
CaO	0.74
MgO	tr.
P_2O_5	0.02
H_2O-	1.35
H_2O+	8.25
SiO_2	45.98
	99.97%

Thus the ore occurring as inclusions is pyrolusite.

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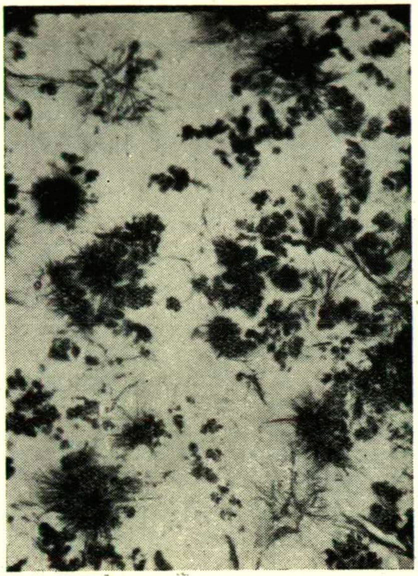

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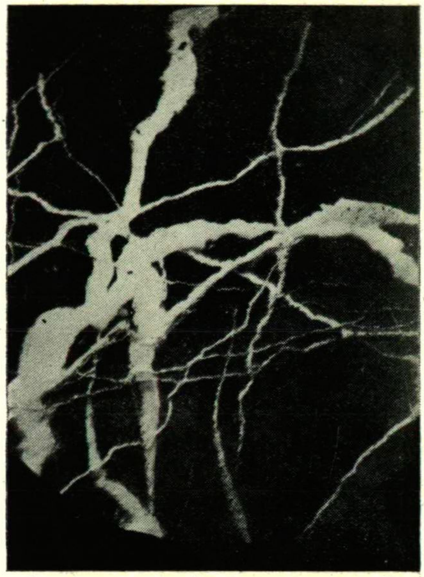

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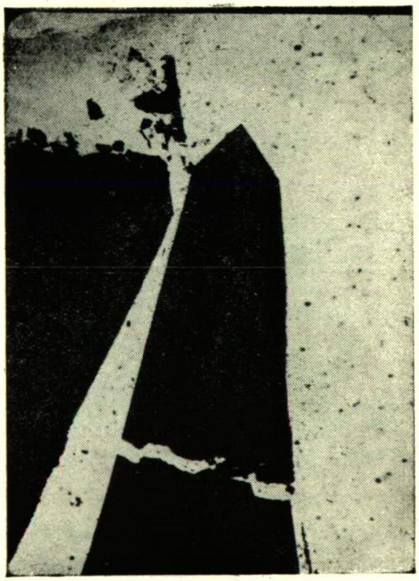

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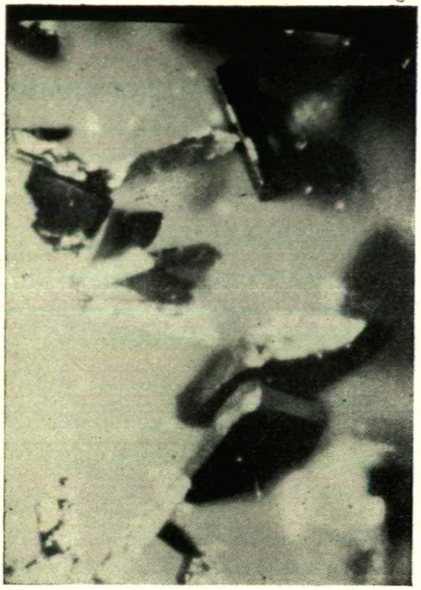

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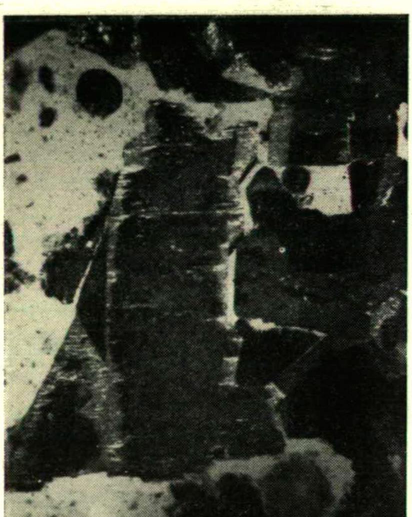

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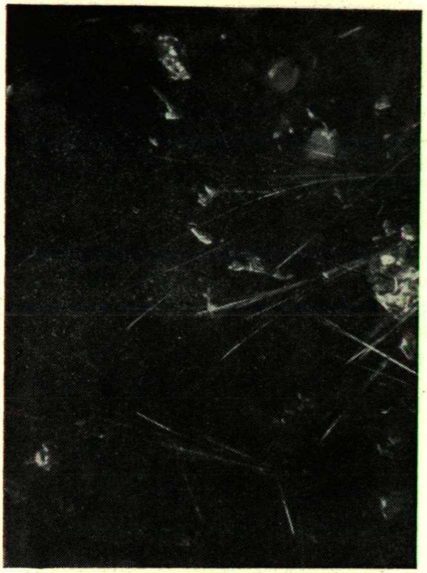

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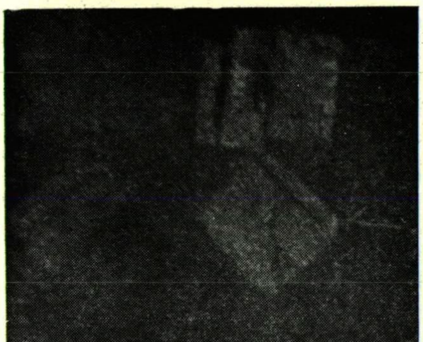

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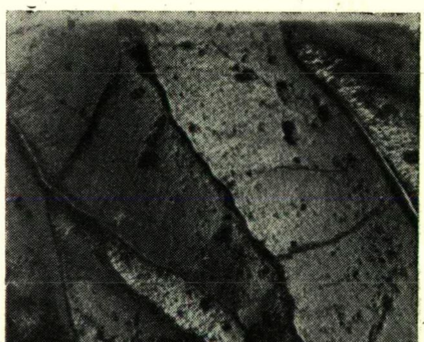

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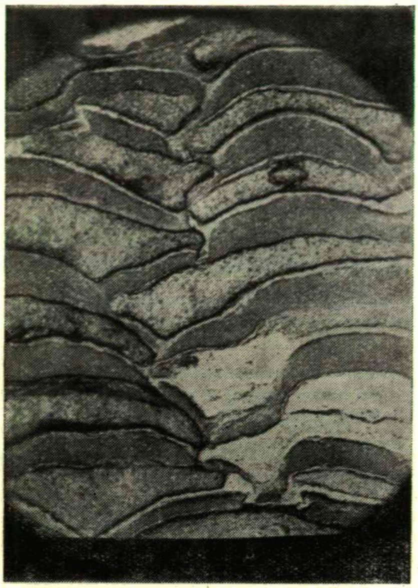

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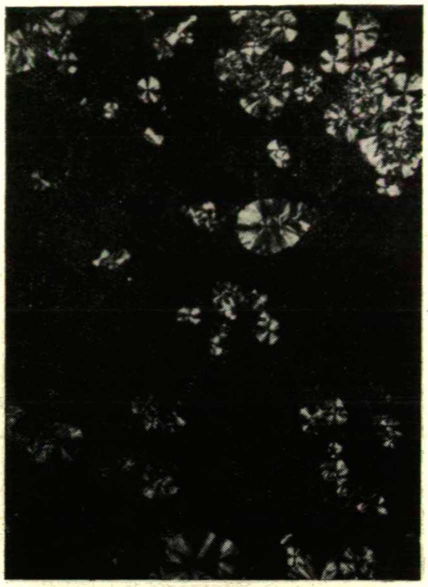

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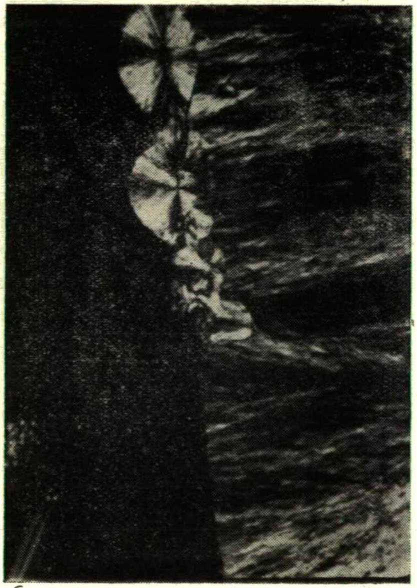

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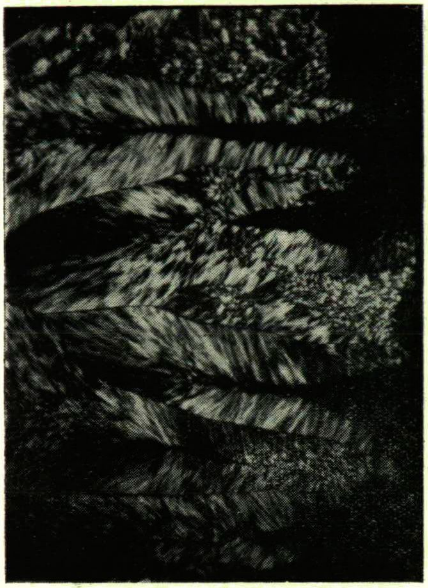

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EXPLANATION OF THE PLATES:

1. Pyrolusite consisting of fine threads separated in globules in jasper. Komlóska. 120 x
2. Gnarly ore. Crystalline pyrolusite veins in a soft groundmass. Etched for 20 seconds with hydrofluoric acid. Urkut. 45 x
3. Manganite crystals in chalcedony. Eplény. 45 x
4. A broken manganite crystal in chalcedony. Eplény. 133 x
5. Manganite crystals is quartz. Eplény. 100 x
6. Chalcedony replacing manganite. Eplény. 70 x
7. Manganite partly transformed into pyrolusite. Eplény. 110 x
8. Manganite, „sheaflike" needle groups in chalcedony. Eplény. 110 x
9. Split manganite needles in quartz. Eplény. 150 x
10. Fine threads of manganite in quartz. Eplény. 67 x.
11. Pyrolusite pseudomorphs after manganite in finely threaded groundmass. Eplény. + N, 120 x
12. Iciclelike group of pyrolusite threads. Epény. + N. 90 x
13. „Cellike' pyrolusite. Eplény. 45 x
14. Chalcedony spherulites in pyrolusite. Eplény. + N. 128 x
15. Chalcedony spherulites and fibrated chalcedony in pyrolusite. Eplény. + N. 150 x
16. Rhythmically separated quartz surrounding chalcedony spherulite. Eplény. + N. 128 x
17. Fibrated chalcedony replacing manganite crystals. Eplény. + N. 69 x
18. Chalcedony, jasper and quartz enclosing manganite crystals. Eplény. + N. 34 x
19. Coarsely crystalline manganite inclusion in finely threaded pyrolusite — manganite — psilomelane. Lábatlan. + N. 80 x

Contributions from the Mineralogical and Petrographical Institute of the University of Szeged. Hungary, 1951.